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Dear Sirs,

I refer to the written opinion of the International Preliminary Examination Authority dated October 22, 2004.

The Applicant respectfully submits the new set of claims, which is believed to overcome the Examiner's objections with regard to clarity for claim 1 and novelty for claim 2. The new set of claims contains independent claim 1 corresponding to claims 1, 6, 11 and 16 as filed; and independent claim 7 corresponding to claims 2 and 6 as filed. The dependent claims have been reorganized and renumbered in consequence.

Claim 1 has been amended so as to include all the necessary matter to define the scope of the invention: the two-dimensional data sets are transformed into three-dimensional images using the Hough transform (step a), two dimensional curves are derived from the three-dimensional images by the application of the Hough transform to depth derivatives of sensor signals, generated by sensors (step b); and an offset is derived from the two-dimensional curves for applying to the two dimensional data sets to depth match them to each other (step c). To derive an offset when the two dimensional curves are known (step c) is almost clear for the person skilled in the art: for example by making a subtraction. Claim 1 is believed to be both

novel and involving an inventive step with regard to D1 and D2, because none of the cited documents discloses or suggests use of Hough transform for performing depth matching.

Claim 7 has been amended so as to include the fact that the data sets are two-dimensional data sets. D1 discloses a method for matching a plurality of curves (23A, 25A) obtained from sensors (23-26). Those curves are processed to obtain "activity functions" (23B, 25B) as described column 8, line 42 to column 9, line 3. To compare 23A and 25A the derivatives of each curve could be compared (line 46); nevertheless "the simple derivative is not suitable because it will give large values even for low amplitude noise" (lines 47-49). That is why, activity functions (23B, 25B) are created corresponding roughly to the curves (23A, 25A) filtered with a high-pass filter. Therefore, this activity function is not an average signal of a two-dimensional data set as described in our invention and the method described in D1 is completely different of our invention. Claim 7 is believed to be both novel and involving an inventive step with regard to D1 and D2, because none of the cited document discloses or suggests a method for matching depth correlating two average signals corresponding to a two-dimensional data set.

It is therefore submitted that the claims are both novel and involve an inventive step and a favourable preliminary examination report is requested.

Yours faithfully,

Catherine Menes
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Encs.

CLAIMS

1. A method for matching a plurality of data sets from boreholes or core sections, the data sets being obtained from sensors are two-dimensional data sets and are indicative of earth formation, boundary, or interface of earth formations and of dip in the vicinity of the borehole, the method for depth matching being characterized in that:

(a) the two-dimensional data sets are transformed into three-dimensional images using the Hough transform;

(b) two dimensional curves are derived from the three-dimensional images by the application of the Hough transform to depth derivatives of sensor signals, generated by sensors; and

(c) an offset is derived from the two-dimensional curves for applying to the two dimensional data sets to depth match them to each other.

2. The method in accordance with claim 1 wherein the method is further characterized in that the two dimensional curves have peaks indicating dip events in the vicinity of the borehole.

3. The method in accordance with claim 1 wherein the method is further characterized in that the two-dimensional data sets have gaps in the data and the three-dimensional images created using the-Hough transform are immune from the gaps.

4. The method in accordance with claim 1 wherein the method is further characterized in that two-dimensional curves for data sets from sensors that are vertically spaced from each other longitudinally along the borehole are processed to determine an offset that will match the two-dimensional curves.

5. The method in accordance with claim 4 wherein the method is further characterized in that the determined offset is applied to the data sets from the vertically spaced sensors to depth match the data sets to each other.

6. A well logging tool comprising a plurality of sensors, a processor, and storage means coupled therebetween, the plurality of sensors adapted to generate data sets indicative of earth formation, boundary, or interface of earth formations and of dip in the vicinity of the borehole, the well logging tool performing the method of claim 1.

7. A method for matching a plurality of data sets from boreholes or core sections, the data sets being obtained from sensors are two-dimensional data sets and are indicative of a boundary, or interface of earth formations and of dip in the vicinity of the borehole, the method for depth matching being characterized in that:

for each two-dimensional data set of the plurality of data sets, individual signals making up the respective two-dimensional data set are combined to create an averaged signal;

averaged signals, each corresponding to one two-dimensional data set, are processed to calculate an offset that correlates the averaged signals; and

the calculated offset is applied to the two-dimensional data sets to depth match them to each other.

8. The method of claim 7 wherein said averaged signal are obtained by determining an average of the sensor signals along the bedding dip for a given depth in the borehole.

9. The method of claim 8 wherein said computation of bedding dips for the sensor signals is performed by way of the Hough transform.

10. The method in accordance with claims 1 or 7 wherein the method is further characterized in that two-dimensional data sets to be depth matched are obtained at the same time by sensors that are vertically spaced from each other longitudinally along the borehole.

11. The method in accordance with claims 1 or 7 wherein the method is further characterized in that two-dimensional data sets to be depth matched are obtained at different times for the same borehole.

12. The method in accordance with claims 1 or 7 wherein the method is further characterized in that a two-dimensional data set to be depth matched is obtained from a core section.

13. The method of claims 1 or 7 wherein each of said sensor signals is obtained from a sensor of a plurality of sensors.

14. The method of claim 13 wherein each sensor includes a plurality of sub sensors.

15. The method of claim 14 wherein each signal includes a trace, the trace being a side-by-side combination of signals from the plurality of sub sensors.

16. The method in accordance with claims 1 or 7 wherein the method is further characterized in that it is applicable to real time depth matching of data sets from sensors that are vertically spaced from each other longitudinally along the borehole.

17. A well logging tool comprising a plurality of sensors, a processor, and storage means coupled therebetween, the plurality of sensors adapted to generate data sets indicative of earth formation, boundary, or interface of earth formations and of dip in the vicinity of the borehole, the well logging tool performing the method of claim 7.

18. The well logging tool of claims 6 or 17, said logging tool adapted to transmit the depth matched data sets to the surface.